NOBELTEC®

Nobeltec® Installation Guide for the InSight™ Radar 2 – Black Box

Higher Resolution . . . Greater Confidence

SAFETY & FIRST AID WARNINGS

ATTENTION – READ CAREFULLY PRIOR TO INSTALLATION

Your Ship's Radar System has a power supply that can easily injure or kill.

NEVER ASSUME POWER TO THE RADAR SYSTEM IS OFF – Always consult your ship's wiring schematics.

- Secure power to your Ship's Radar System by placing the power breaker in the OFF or OPEN position.
- Remove all fuses (even spares) from circuits where a switch might unintentionally be closed.
- Verify power is secured by testing the circuit with a multimeter.

All personnel engaged in the installation, operation, and maintenance of electronic equipment, or those who are engaged in training personnel on electronic equipment, have a duty to know the following safety precautions:

1. **High Voltage**:
   - DO NOT RELY on safety devices
   - USE GROUNDING STICKS AND CABLES when working with high voltage circuits
   - USE RUBBER GLOVES that have been tested within the last six months when applicable
   - KEEP YOUR FEET CLEAR of objects on the floor
   - STAND ON A RUBBER MAT or non-conductive flooring
   - Whenever possible, HAVE ANOTHER PERSON PRESENT, who is qualified in FIRST AID for ELECTRICAL SHOCK
2. **Low Voltage**:
   - Use a ground mat to prevent static electricity discharges
   - Do not touch any electronic card components when the power is ON
   - Always disconnect the power when a system is not in use
   - Power down before you change any hardware devices - a power surge could damage the electronic components or the whole system
   - Piezo ignited soldering irons could damage integrated circuit boards (ICBs)! Only use a piezo-ignited soldering iron only at a safe distance from ICB electronics!
3. **Rescuing Shock Victims**:
   - PROTECT YOURSELF with DRY insulating material
   - BREAK THE CIRCUIT by opening the power switch or, using insulating material, pulling the victim free of the live conductor
   - DO NOT TOUCH THE VICTIM WITH YOUR BARE HANDS UNTIL THE CIRCUIT IS BROKEN

Table of Contents

INSIGHT RADAR 2 – BLACK BOX PRODUCT DESCRIPTION

Jeppesen Marine's Nobeltec® **InSight™ Radar 2 - Black Box (IR2-BB)** radar solution provides high-resolution radar data and functionality in conjunction with Nobeltec Navigation Software.

The **IR2-BB** receives radar data from the Radar Head Unit, conditions and digitizes raw radar signals, and converts radar echo data into digital radials. Data is transmitted over a high-quality USB cable to a USB 2.0 port on any new or existing navigation PC or laptop similarly equipped.

The **IR2-BB** matches connection specifications for many of the industry's leading X- or C-band radar models. Contact your Nobeltec product distributor to verify if your system interfaces with the **IR2-BB**.

The **IR2-BB** is designed for intuitive usage and command execution. With a familiar appearance similar to a common radar screen, users will quickly become adept at operating the **IR2-BB** system.

This Installation Guide covers the key installation information for the **IR2-BB**. It is written for an audience assumed to have a mid-level, pre-existing knowledge of PC operation and the principles of marine navigation, as well as previous marine installation experience.

This document should in no way be used to replace actual navigation training and experience.

Product Box Physical Contents

Your IR2-BB product box should contain the following items:

- One (1) IR2-BB conversion device (black box that processes radar signals)
- Three cables:
    - One (1) 12V Power cable
    - One (1) USB 2.0 data cable
    - One (1) radar interface cable (with Furuno® slave output connector)
- One (1) Nobeltec Visual Navigation Suite Software CD
    - One (1) Radar Unlock Code Voucher
- One (1) IR2-BB Installation CD
- Serial Number Sticker
- Three (3) manuals including:
    - This Installation Guide
    - One (1) Nobeltec Visual Navigation Suite Software User's Guide
    - One (1) InSight Radar Operator's Manual

Typical Installation

Figure 1 - Typical IR2-BB Installation

Product Specifications and System Requirements

Specification	Basic Box
Weight	405 g (14.3 oz)
Dimensions	18.5 cm x 10.9 cm x 3.5 cm (7.3" x 4.3 in x 1.4")
Power	10-36 VDC
Radar source data	Digitization and processing
Samples/radial	512
Radials/image	1024 (360°)
Display	Real-time radar data
Interface	USB 2.0 that connects to a Type-A or Type-B male connector (using high-quality USB cable)
Networking	Ethernet with TCP/IP (through client PC)
Multi-client support	Yes (through client PC)
Control Configuration	Slave
Computer Operating System	Windows® XP or Windows® 2000

Table 1 - IR2-BB Specifications

PART 1: INTRODUCTION

Purpose of this Installation Guide

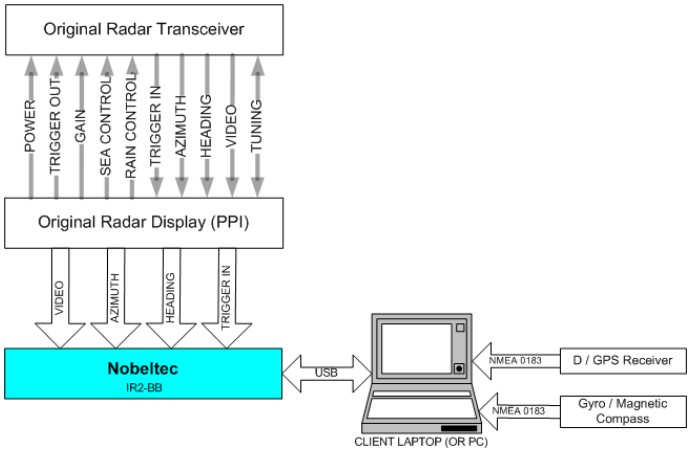
This manual is intended for the use of approved system installers only. It provides the facts, figures, and general information required to quickly and successfully install and maintain a Nobeltec InSight Radar 2 - Black Box.

Installation of a Nobeltec InSight Radar 2 - Black Box requires marine installation experience. Please see the **Legal Disclaimer** on **Page 43** for more information.

A NOTE ABOUT THIS MANUAL
This manual is not a comprehensive guide to radar technology or ship electronics. This manual is also not a quick guide for non-technical personnel, shipbuilders or end users. • This manual is an aid to installation only. There are factors Jeppesen Marine cannot control, such as improper or careless handling, which can affect the results. • It is the installer's responsibility to exercise the necessary level of knowledge, skill, and prudent care to insure a successful installation.

IR2-BB Functionality Defined

The IR2-BB operates as a fully integrated "slave" to an existing radar display unit. With an open loop connection to a previously installed radar display, the slave listens to signals being passed from the transceiver to the radar display. The slave unit digitizes the Video, Trigger, Ship's Heading Marker (SHM), and Bearing Pulse (BP) subset of the signals. The resulting radar data is processed by Nobeltec Navigation Software for display on the same PC, or shared to other Nobeltec software on other PCs.



Standard Configuration

Figure 2 – IR2-BB Configuration Structure

PART 2: INSTALLATION

Part 2 contains the following:

IR2-BB Installation Preparation and Overview

Step 1: Select IR2-BB Mounting Location and Environment

Step 2: Connect Wiring

Step 3: Install Nobeltec Navigation Software

Step 4: Run the IR2-BB Installer CD

Step 5: Select the Radar Antenna File

Step 6: Run the Radar Setup Wizard

Step 7: Launch Nobeltec Navigation Software

IR2-BB Installation Preparation and Overview

The InSight Radar 2 - Black Box is designed and developed for reliability and flexibility. Proper installation will insure long life of the product in harsh marine environments.

The following installation tools are recommended:

Figure 3 - Installation Tools

Tool	Comment	Tool	Comment
Chisels	Wood	Pliers	Needle nose
Clamps	Various size	Pliers	Short nose
Crescent wrench	8”	Propane Torch	Small
Drill bits	Full set	Sandpaper	Coarse and medium
Electric drill	3/8” or ½”	Screwdrivers: Phillips Robertson Slot	Small & medium sizes
Electrician’s tape			
Files	Wood		
Hand Riveter		Solder	Flux core
Heat shrink tubing	¼” O.D.	Soldering iron	Fine tip
Jig saw	Scrolling blades	Voltmeter	Basic
Keyhole saw	Wood & metal blades	Wire ties	Various sizes

Table 2 - Installation Tools

Installation Types

The IR2-BB is compatible with most Radar models using one of two interface methods:

- **Type 1 – Furuno w/ Slave Output Installation**: Connection of the IR2-BB to Furuno Radar with Slave Output.
- **Type 2 – All Other Models Installation**: All other Radar models, brands, and types, (including Furuno without Slave Output)

If you should encounter any undocumented problems while connecting Nobeltec equipment to your Radar model, please contact Nobeltec using one of the methods described on the Back Cover of this Installation Guide.

Preparing the Workplace

Confirm the install location is ready (See **Step 1** on Page 11):

- Bulkheads and cabinets are accessible, dry, well-ventilated, and protected from the elements;
- The IR2-BB must be mounted within 1.8 meters (6 feet) of the radar plotter.
- Work area is available, nearby, and protected from elements
- Work area is free of other construction or installation work
- Radar is functional and ready to connect

Planning the Work

- Assemble the tools and material required for the installation (see **Table 2 - Installation Tools** on Page 9).
- **Type 1 – Furuno w/ Slave Output Installation**: Insure that Furuno Slave Output connector is accessible.
- **Type 2 – All Other Models Installation**: Insure radar signal cables are installed and ready to connect, or identify where the existing radar signal will be accessed (refer to the radar and transceiver installation manuals for precise specifications).
- Confirm the power installed is adequate and routed through a circuit breaker, and the wiring is accessible.

IMPORTANT: In advance of installation, be sure to redeem the radar unlock voucher that shipped with your IR2-BB at www.nobeltec.com. In order to obtain the radar unlock code, you will need to provide your Nobeltec software Serial Number along with the voucher number (see **Page 17**).

Installing the System

- Follow the step-by-step instructions in **Step 1** on Page 11 to complete the physical mounting and electrical/wiring of the InSight Radar 2 – Black Box system.
- Refer to the settings in **Step 5** on Page 20 for the correct settings for your particular radar transceiver.

Completing the Installation

- Verify that all connections are secure.
- After completing **Steps 1-7**, turn on the power. The radar should still be functional with the original display.
- Install and configure your Nobeltec Navigation Software on the client computer(s).

Tip: Refer to your Nobeltec Navigation Software User's Manual, Set-up section, for detailed instructions regarding how to implement that software.

STEP 1: Select IR2-BB Mounting Location and Environment

The IR2-BB must be securely installed in an appropriate location to reach both the PC and the existing radar. The following paragraphs include considerations to make when selecting the ideal physical placement of the IR2-BB onboard the vessel.

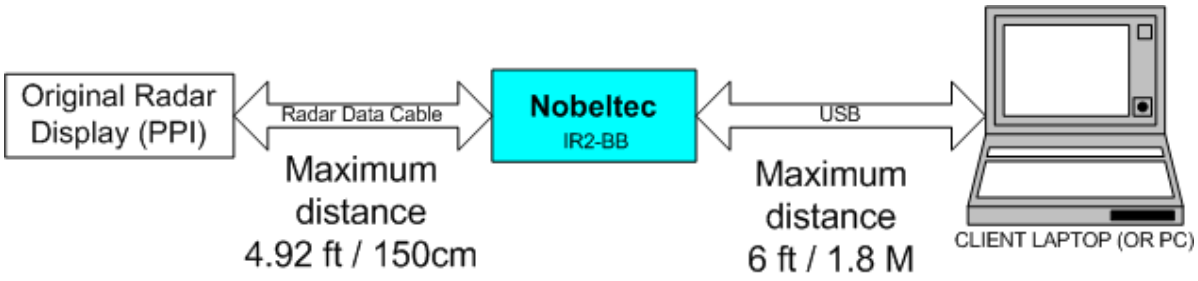


Figure 4 – Installation Cable Distance Limits

Note: Voltage drop across the GND lead limits the maximum cable length. This voltage drop is dependent on cable gauge. While longer USB 2.0 (high-quality) cables are likely to perform adequately at a distance of up to 15 feet, this product has only been tested for performance using 6-foot cables.

Safety Precautions:

It is important to secure all equipment modules to LEVEL, SAFE and DRY surfaces.

FIRST: Turn the Power OFF! Fire, shock, or other injuries can result from power being left on - or turned on - during equipment installation.

Avoid getting the unit wet! Placing the unit in water or allowing it to get wet from rain, splashing, or spills, can result in electrical shock or damage to the equipment.

Verify that the PC connected to the IR2-BB uses only GROUNDED connections!

- Only qualified personnel should open the equipment.

Practical Considerations:

The radar unit case, containing the radar board, and interconnections, must be securely mounted to the vessel.

Consider four things when choosing a mounting location:

- **Accessibility** - for easy installation and maintenance
- **Proximity** - to power and signal wiring in place or effective routes for new wiring
- **Safety -** to prevent damage to its contents or the cabling in adverse weather
- **Durability -** to insure reliable operation over time.

Mounting Locations

- Shipboard installations require that every mounting location effectively protect radar components from:
  - Water and excessive humidity (rust and corrosion);
  - Hot environments (overheating);
  - Sunlight (visibility and overheating); and
  - Physical damage.
- Unit must be supported securely in a position where it is easy to access the unit components (power switch and wiring) as required.
- Closed spaces must allow and provide a flow of air sufficient to cool the IR2-BB to normal operating temperatures without causing condensation on or inside the unit.
- Keep clearance dimensions of at least **100 mm** (**4 inches**) around the fan intake and exhaust louvers to prevent possible overheating.
- Add an appropriate allowance for strain relief to the measured length of cables before installation.

Environment

Humidity and temperature are the two key environmental factors.

Arctic winters and tropical summers are significantly different from each other, and impose different operating requirements to minimize the impact of each.

Proper installation takes into consideration the widest range of conditions to which the vessel may be exposed in the course of its operating life.

Table 3 contains the basic specifications for a dry, non-condensing environment.

Nobeltec	Operating Conditions Range	
Model Name	Temperature	Humidity
IR2-BB	0° - 45° C	85%

Table 3 - IR2-BB Operating Conditions Ranges

STEP 2: Connect Wiring

Figure 5 - IR2-BB Back Panel

STEP 2A: Connect the Radar Interface Cable

Connection to the existing radar antenna varies by model and vendor type.

Figure 6 - Radar Interface Cable

For a **Type 1 – Furuno w/ Slave Output Installation**:

1. Attach the DB15-pin Radar Interface Cable connector to the IR2-BB DB15-pin port (Note that the IR2-BB port is labeled *Radar Interface*).
2. Attach Flat 11-pin Radar Interface Cable connector to the Furuno slave output port. (Note that the Radar Interface Cable ships with a Flat-11pin connector for connecting to a Furuno slave output connector).

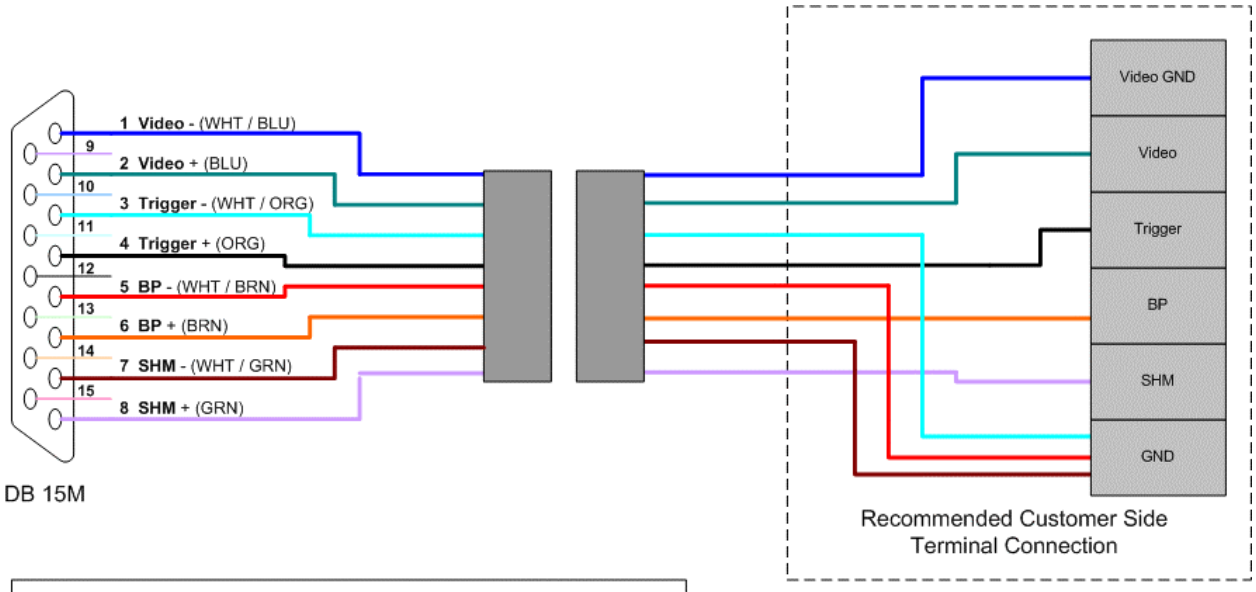
For a **Type 2 – All Other Models Installation**:

1. Attach the DB15-pin Radar Interface Cable connector to the IR2-BB DB15-pin port (Note the IR2-BB port is labeled *Radar Interface*).
2. Remove (or cut) Furuno slave output connector from the other end of the cable.
3. There are 4 ways to access radar signal:
    a. An existing transceiver-to-display unit cable
    b. A Slave output option connector (for non-Furuno radars)
    c. A radar display Buffer Board connector, *or*
    d. A Slave Connector Block (SCB) within the radar transceiver

    In all cases, specific data feeds from the radar must be connected to the IR2-BB data cable. This requires soldering and/or splicing the connections together. Refer to **Addendum B** for more information.

Tip: For both types of installation, ground wires also must be connected.

Soldering/Splicing the Data Cable



Notes:

Pin 7 and Pin 10 have been shorted inside connector.
Twisted-pair Cat-5 cable is suggested.
The cable length is 3 feet or less.

Figure 7 – Data Cable Connector Pin Diagram

STEP 2B: Connect the USB 2.0 data cable

The provided USB 2.0 data cable can now be connected to the IR2-BB and any available **USB 2.0 port** on the onboard PC.

Figure 8 - USB 2.0 data cable

Tip: It is crucial that the USB 2.0 data cable is securely attached to the IR2-BB device, especially if the IR2-BB is mounted on a wall or upside down. It is recommended that the USB 2.0 data cable be fastened in such as way that it will not come loose from the IR2-BB at any time.

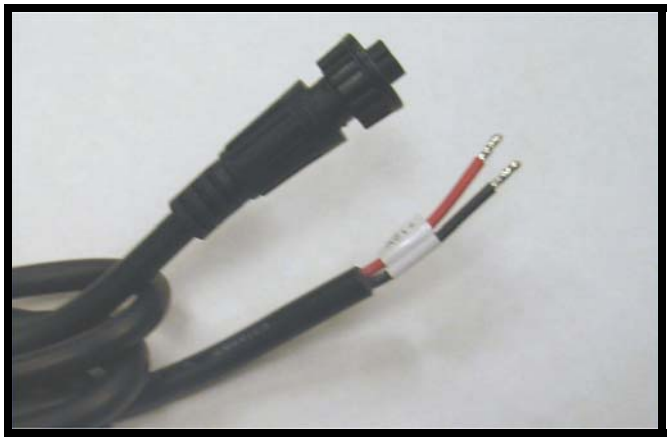


Figure 9 - Power Cable

STEP 2C: Connect the Power Cable

Route 12 VDC power to the unit via a breaker on the ship's main or distribution panel, connecting to the main radar switch/breaker whenever possible.

Connect +ve to +ve, -ve to –ve.

WARNING: Insure the power connection runs through a circuit breaker equipped with an on/off switch!

External Power Supply Pin Connections

The InSight radar system is configured for 12 VDC. It draws on average 1.5 ampere @ 12 VDC. Power is wired through a two-pin connector. The external power connector wiring is pictured in **Figure 10**.

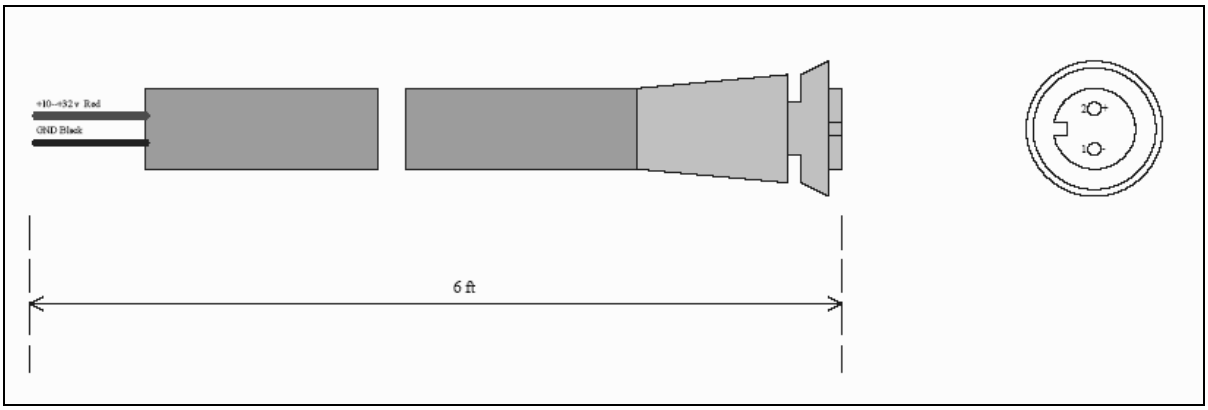


Figure 10 - Power Connection Cable

Radar Model	Power Requirements (w/o transceiver)	
	12 VDC	
	Operating Range VDC	Max. Power Consumption
IR2-BB	10 - 36	5.5W

Table 4 - System Power Requirements

STEP 3: Install Nobeltec Navigation Software

Both **Nobeltec Admiral™** and **Visual Navigation Suite (VNS)™** are capable of displaying radar feeds from the IR2-BB and are designed to support this product.

If you have not yet installed one of these navigation software packages on your PC, please do so at this time.

Assistance with installation of the Nobeltec Navigation Software is included in the Nobeltec Navigation Software User's Guide.

STEP 3A: Unlock Radar Functionality within the Navigation Software

Once the software is installed, the radar functionality must be unlocked with an **Unlock Code**. Use the voucher included with the product box (see **Page 5**) to redeem the voucher and obtain the Radar Unlock Code (see **Figure 11**).

Note: For users of Nobeltec Navigation Software versions 7.x, refer to your User's Guide for unlock instructions.

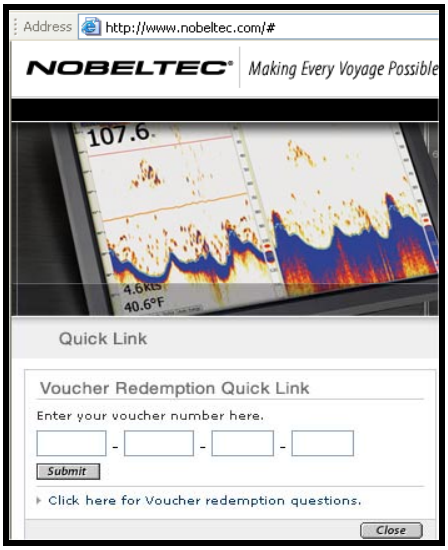


Figure 11 - Example of Voucher Redemption Webpage

The Radar Unlock Code can then be entered into the Nobeltec Navigation Software application.

1. From the Chart Table, select **Permits and Unlock Codes**.
2. Click the **Install** button, and then enter the unlock code in the provided field.

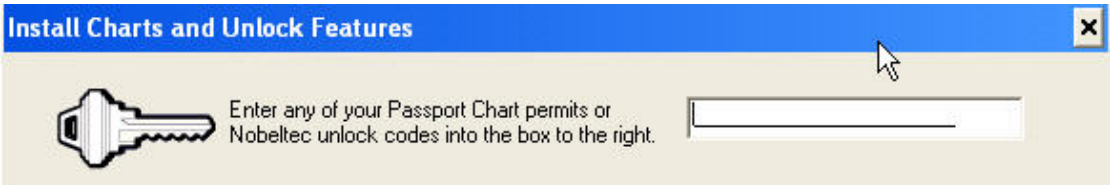


Figure 12 - Example of Radar Unlock Code Window

3. Once the code is accepted, the program can be closed.

STEP 4: Run the IR2-BB Installer CD

The IR2-BB Installation CD, which shipped with the IR2-BB, can now be inserted into your computer. This CD installs the drivers required for the Nobeltec Navigation Software to communicate with the IR2-BB.

Follow the installation wizard, restarting the computer when prompted, as shown in **Figures 13-16**.

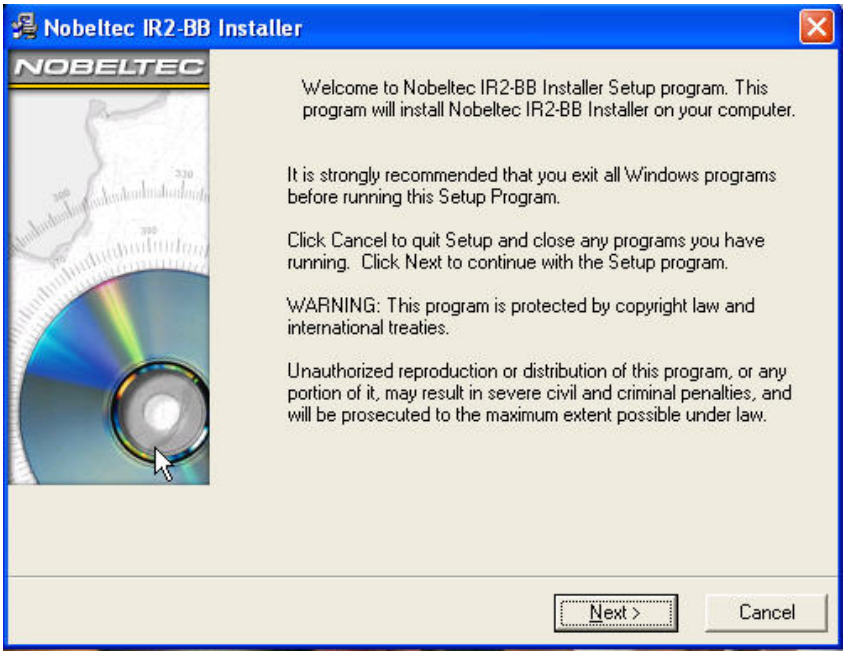


Figure 13 – Nobeltec IR2-BB Installer Welcome Screen – Click Next

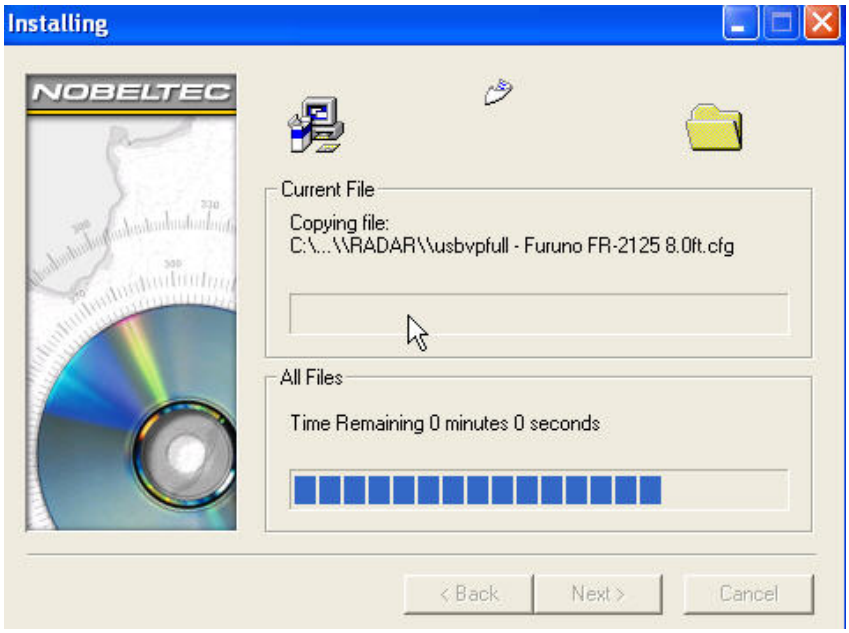


Figure 14 – Installing Progress Bar(s)

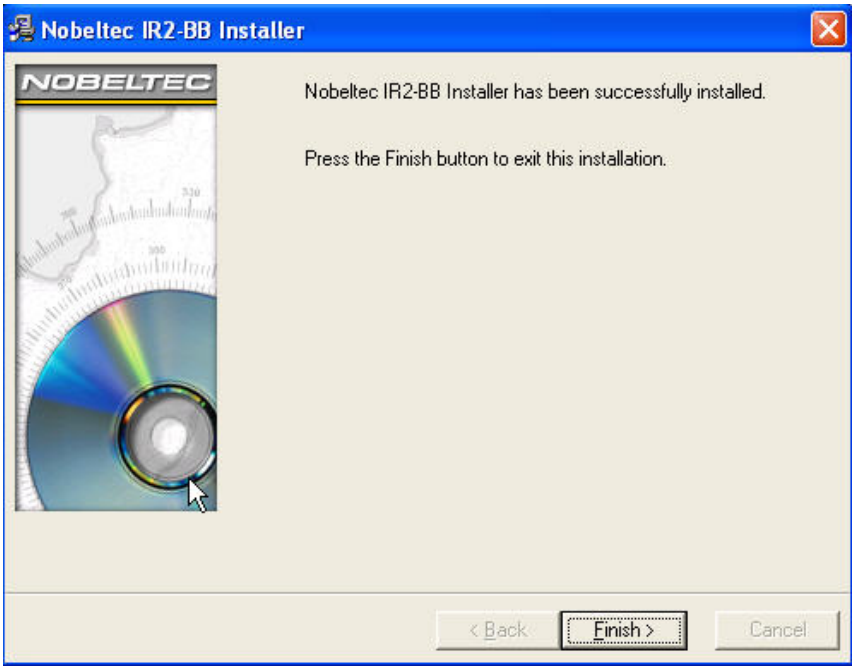


Figure 15 – Installation Complete – Click Finish

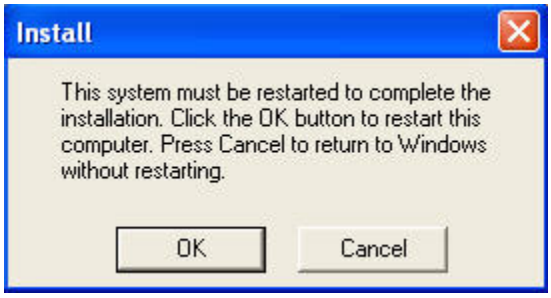


Figure 16 – Restart Your Computer – Click OK

STEP 5: Select the Radar Antenna File

Once the installation of the IR2-BB is complete and your computer has rebooted, the Settings program window will appear. Use this window to select a Radar Antenna file.

IR2-BB uses the information contained in the selected Radar Antenna File to interpret the radar signals. If the Settings program does not appear after install, or if you need to select a different antenna file, run this program manually. The Settings Program for this file is located in C:\\Program Files\Nobeltec\horizonserver.exe.

This list contains all known radar types at the time of the IR2-BB's release (10/05). **Select your radar from the list**, click **SAVE**, and then click **START**.

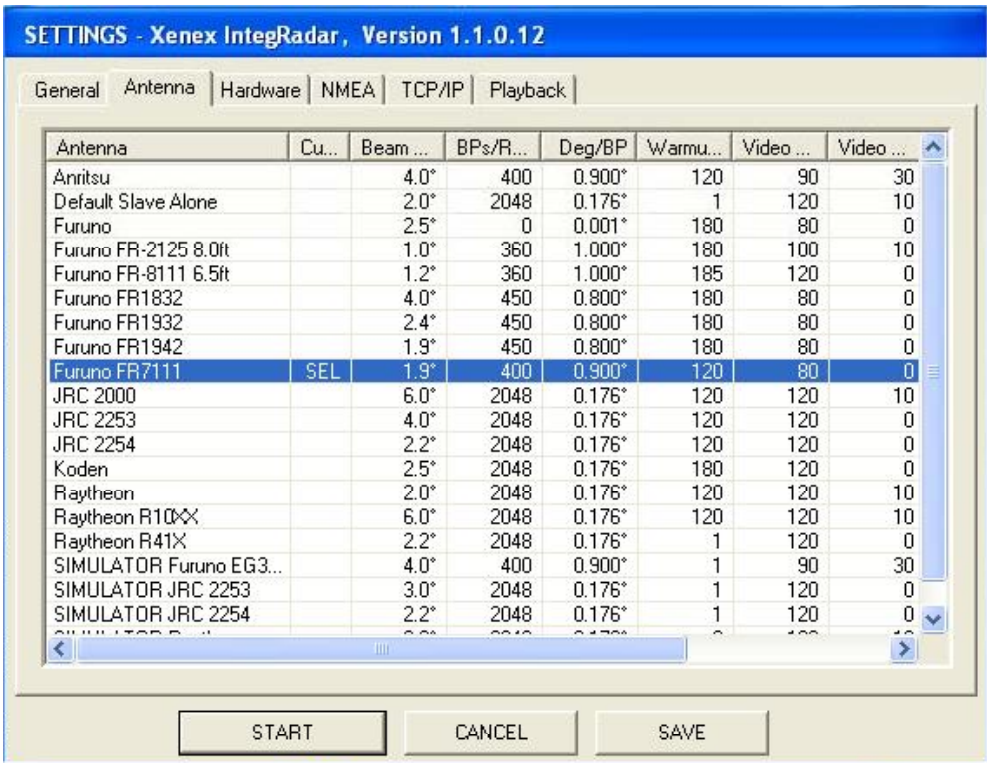


Figure 17 - Example of Settings Program List of Supported Radars

If your radar type does not appear in this list, check with Nobeltec Technical Support - a new radar antenna file may be available for you. Otherwise, select the closest match, click **SAVE**, click **START**, and then go to **Part 3** on Page 24 to fine-tune your radar antenna file.

STEP 6: Run the Radar Setup Wizard

The radar can now be powered on - use the existing radar display to operate the radar so that it is broadcasting and displaying returns.

Next, run the Radar Setup Wizard:

From the Start menu, select **Start→Programs→Nobeltec→Radar Setup Wizard**.

The Radar Setup Wizard will detect the IR2-BB and save the settings needed for the Nobeltec Navigation Software to see the device when it is started.

Follow the steps in the Setup Wizard (see **Figures 18-23**) to configure, calibrate and adjust your radar.

Figure 18 – Radar Setup Wizard Welcome Screen – Click Next

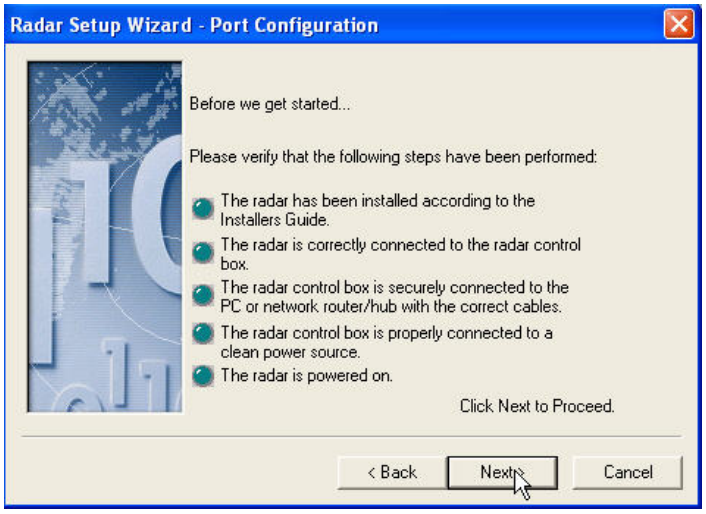


Figure 19 – Radar Setup Wizard - Port Configuration – Click Next

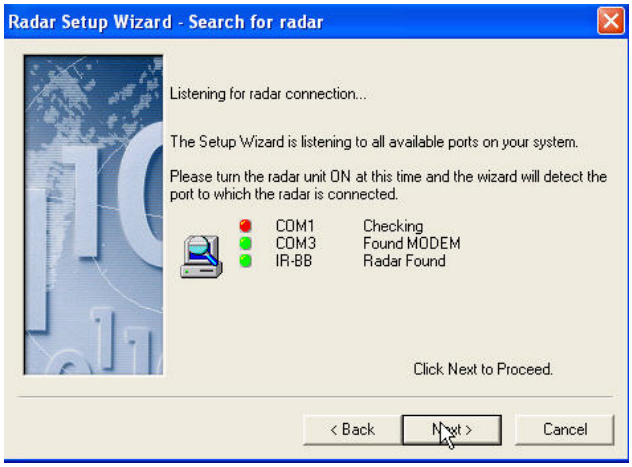


Figure 20 – Radar Setup Wizard - Search for Radar – Click Next

Figure 21 – Radar Setup Window - Radar Status – Click Next

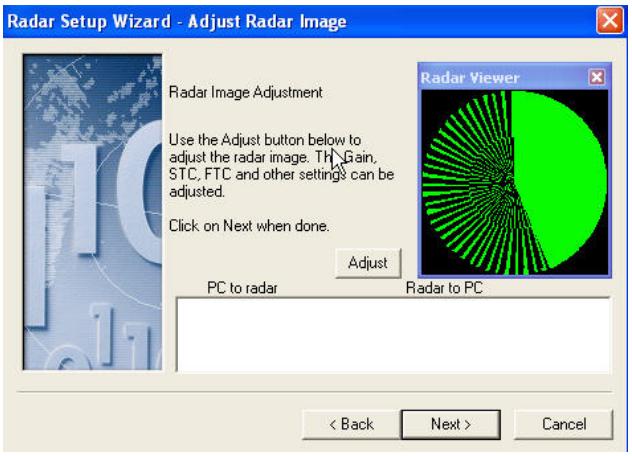


Figure 22 – Radar Setup Window - Adjust Radar Image – Click Adjust to modify settings

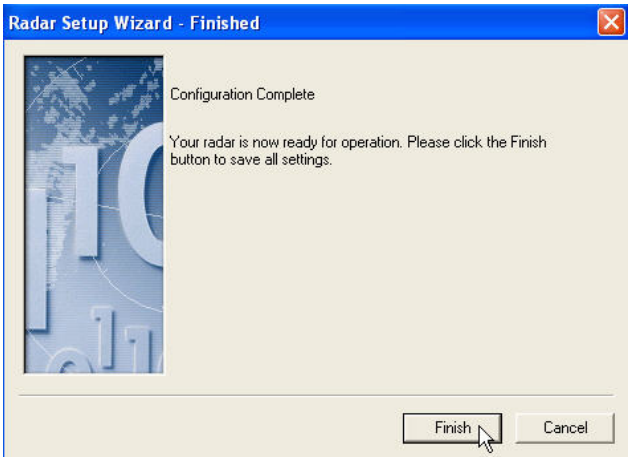


Figure 23 – Radar Setup Window Completed – Click Finish

STEP 7: Launch Nobeltec Navigation Software

Now that the hardware has been configured, you are ready to view the radar data inside of Nobeltec Navigation Software.

1. Double-click on the Nobeltec Software Icon, *or*
2. Click START→Programs→Nobeltec→Nobeltec Navigation
3. The Radar Window will open in Standby Mode (see **Figure 24**).

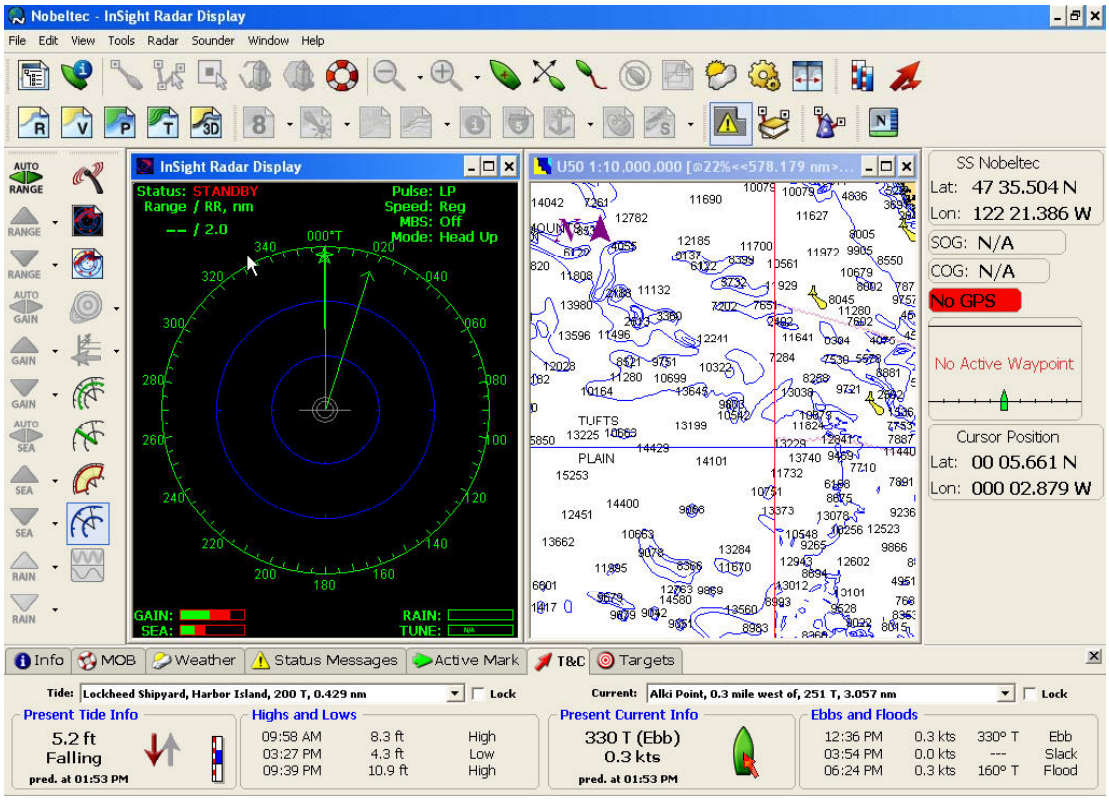


Figure 24 – Insight Radar Display window

4. Click Transmit  in the left-hand toolbar
5. A radar image will then display in the display window – see your InSight Radar Operator's Manual for information on how to use this display

Figure 25 – Insight Radar Display – Transmitted Radar Image

PART 3: USING RADARSAMPLE TO SET UP THE IR2-BB

Note: You may not need to perform **Part 3** – this section is only used to configure radar without a correct Radar Antenna File to select from in **Part 2 – Step 5**, or to perform fine-tuning of your radar signal.

The IR2-BB ships with an installation CD containing the RadarSample program. This utility is used to verify correct installation and setup of your IR2-BB product. You can also use this program to configure a radar antenna when a Radar Antenna File has not yet been created.

As noted in **Part 2 – Step 5** (see **Page 20**), the software running on the onboard PC needs to know which radar antenna it is connected to. **Step 5** describes how to select a Radar Antenna File from a list of known antenna types (see **Figure 17** on Page 20).

If your particular radar does not appear in that list, the RadarSample program is used to configure a new Radar Antenna File.

RadarSample Overview

The main RadarSample window shows the radar image (see **Figure 26**).

You can adjust this image for range, orientation, and centering, as well as the standard radar adjustments (gain, rain and sea clutter suppression, etc.), using the settings in the RadarSample Main USB Settings window (see **Figure 27**).

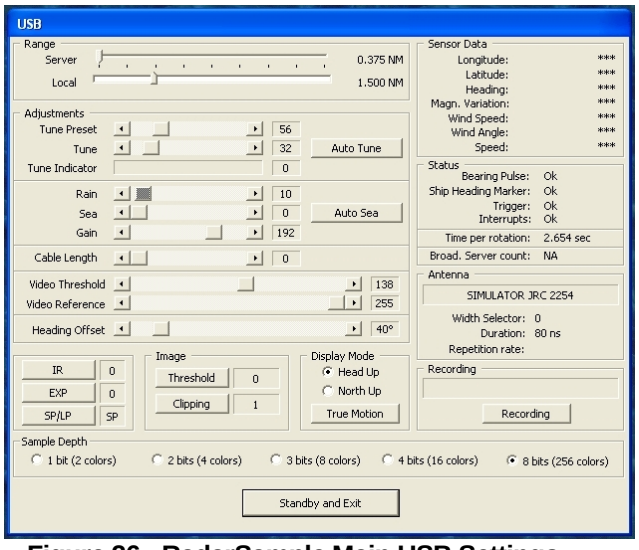


Figure 26 - RadarSample Main USB Settings Window

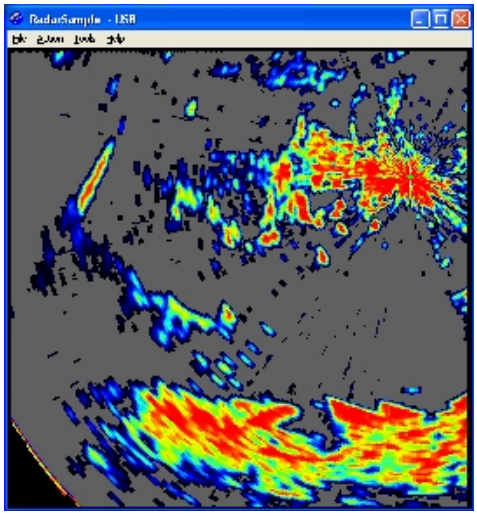


Figure 27 - RadarSample Main Window

Steps to Configure a Non-Nobeltec Radar Using the RadarSample Program:

1. Power on the IR2-BB and the radar. Verify that the radar is working properly
2. Launch the RadarSample.exe program from:
   Start→Programs→Nobeltec→Visual Series→Radar→RadarSample.exe
3. Select **USB** from the Action drop-down menu;
4. Select the radar antenna that the IR2-BB is interfaced to – *this should match the antenna selected when setting up the Server software in **Step 5** on Page 20*;

   Note: The RadarSample window will now be titled **RadarSample - USB**.
5. Remove the checkmark next to **Standby** in the Action menu (taking the IR2-BB out of standby mode).
6. The USB Settings window will display
   a. At this point, you should see radar imagery in the RadarSample image window, similar to that shown in **Figure 27**. You may off-center this image using the left mouse button when the mouse is anywhere in the Radar Image Display window.
7. Adjust the values in the RadarSample USB Settings window until the radar returns shown in the display window meet your required specifications and have been optimized.
8. **SAVE** all changes and exit the RadarSample program.

Setting Antenna-Specific Parameters

The IR2-BB requires the antenna-specific parameters to be correctly set in order to process each of the incoming analog signals [Trigger, Video, Bearing Pulse (BP), and Ship Heading Marker (SHM)].

TRIGGER

This signal is used to tell the transceiver when to transmit. The IR2-BB uses this signal to determine when to start digitizing the video signal (see below).

⚠ **WARNING:** If the **Trigger** signal parameters are not correctly set, the IR2-BB will not be able to locate the **Trigger** signal; no data will be available for rendering.

The **Trigger** signal is the most important - until **Trigger** is properly set up, the other two data signals (**SHM** and **BP**) will not be properly detected.

This is a relatively high-frequency, short-duration signal.

SHIP'S HEADING MARKER (SHM)

This signal occurs once for every 360° sweep of the radar antenna, and tells the IR2-BB that the radar antenna is currently aligned with the ship's heading.

This is a relatively low-frequency, long-duration signal.

BEARING PULSE (BP)

This signal occurs at regular intervals as the antenna rotates. The number of bearing pulses per 360° sweep varies with radar type. By counting these bearing pulses, the IR2-BB can calculate which direction (relative to ship's heading) the radar antenna is pointing;

This is a relatively high-frequency, medium-duration signal.

VIDEO

This signal contains the actual radar data that, when digitized by the IR2-BB, makes up the radar scan line data used to generate the radar image.

APPENDIX A: GENERAL MAINTENANCE AND TROUBLESHOOTING

Hardware Diagnostics

Note: Before the Nobeltec software connects to the Radar Server, your radar and the IR2-BB should be powered on. At that time, the Nobeltec Navigation Software can receive radar data.

The normal sequence of operating procedures is:

1. Power on
2. Start Up
3. Fine-tune
4. Observe
5. Adjust Video
6. Perform Data Acquisition and Measurement
7. End Operations
8. Shut Down System

Warning Signs	Action
No power to LED?	Check power cord: • Do you get DC power input? Range: 10 - 36 VDC • Is the polarity correct? Red: positive, Black: GND • Is the power connector securely attached?
Do LEDs (A, B, or C) turn on?	Check USB 2.0 data cable connection: • Does host PC turn on? • Is USB 2.0 data cable properly connected to both IR2-BB and PC?
No radar rotation	Service the radar transceiver
No radar heading	• Check the transceiver signal cable for a loose connection or cable damage • Check for radar rotation
No sensor data	• Check the sensor signal cable for a loose connection or cable damage • Check serial port assignments
Does Windows show "USB Device Not Recognized" message?	If yes, check USB: • Make sure you have a **USB 2.0** host controller;

	• Make sure you plug the USB 2.0 data cable into the **USB 2.0 host controller port**.
Can you see "Xenex Video Processor" in your Windows Device Manager?	If not: • Uninstall and Reinstall driver files: o XVPUSB.inf o XVPUSB.sys
Mouse not working or Keyboard not working:	• Check the cord for a loose connection or damage • Check P/S2 port assignments
None of the above	For Technical Support, contact Nobeltec using one of the methods shown on the Back Cover of this Installation Guide.

Table 5 - Hardware Troubleshooting

Troubleshooting Flowchart

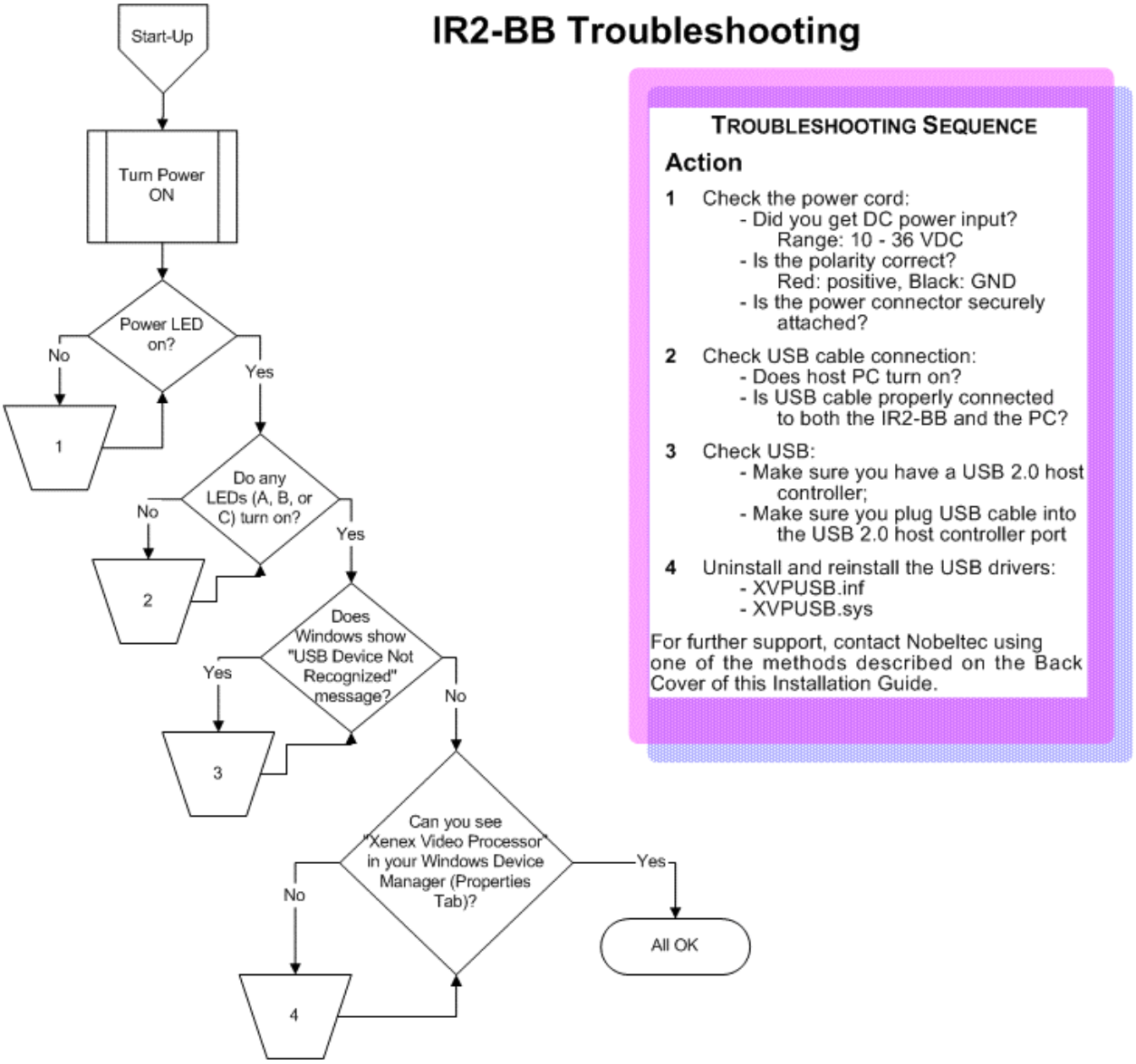


Figure 28 –System Startup Troubleshooting

Troubleshooting Radar Data Using RadarSample

Verify Data Reception

If you do not see any radar data in the main window, or if the data looks very poor, verify that the signals are being correctly received.

From the USB Settings window, examine the **Status** box, on the right-hand side of the screen. The status of the three main signals (Trigger, Bearing Pulse and Ship's Heading Marker) will be displayed as either ***OK*** or ***Missing***.

Note: Occasionally, the status display will be **Error**. If this occurs, verify that the IR2-BB is still turned on and interfaced via USB 2.0 port to the PC.

Acquiring Trigger, Ship Heading Marker, and Bearing Pulse Signals

If the Trigger, Ship's Heading Marker or Bearing Pulse signals are missing, adjust the Settings as shown in **Table 6**:

Sample Depth	8 bits
Rain	0
Gain	255
Video Threshold	0
Video Reference	255
IR	0
EXP	0
Threshold	0
Clipping	1

Table 6 – Signal Settings Adjustments

In the **Tools** menu, click on **USB VP Extended Control**, - this will open the USB VP Extended Control Settings window (see **Figure 29**).

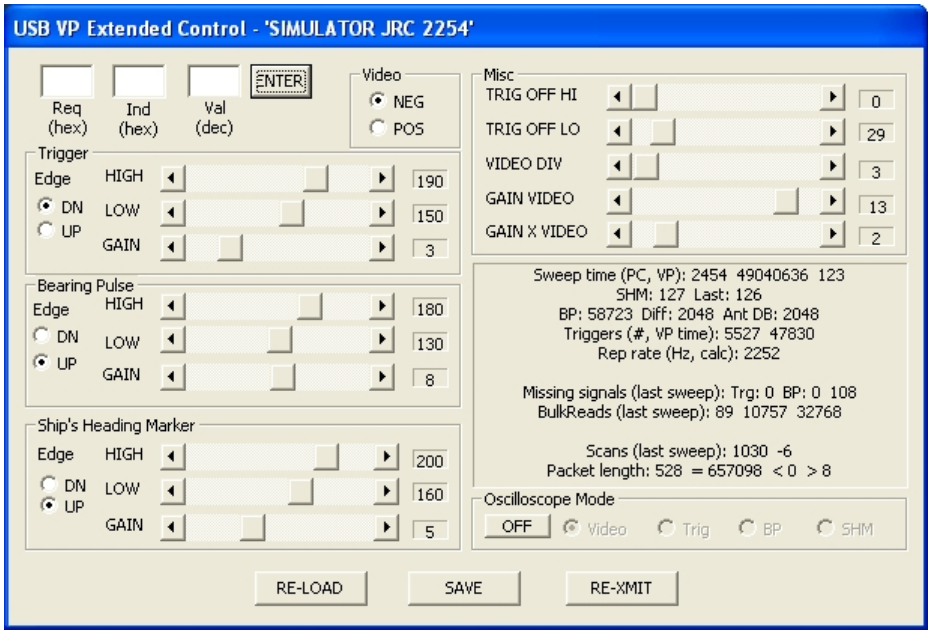


Figure 29 - RadarSample USB VP Antenna Signal Setup Window

Using Oscilloscope Mode to Improve Signal Reception

An **Oscilloscope Mode** is available to improve the signal setup process. The Oscilloscope Mode settings are on the lower right side in the USB VP Extended Control window (see **Figure 29**).

Figure 30 – Oscilloscope Mode Settings

Oscilloscope Mode and the **Radar Raw Scan Line Profile** window (see **Figure 31**) will allow you to graphically display each of the analog radar signals one at a time, based on the selection made in the Oscilloscope Mode section of the USB VP Extended Control window.

Open the **Radar Raw Scan Line Profile** window from the Tools drop-down menu.

The **Radar Raw Scan Line Profile** window also has a histogram of scan line sample values, displayed in the right portion of the window (see **Figure 31**).

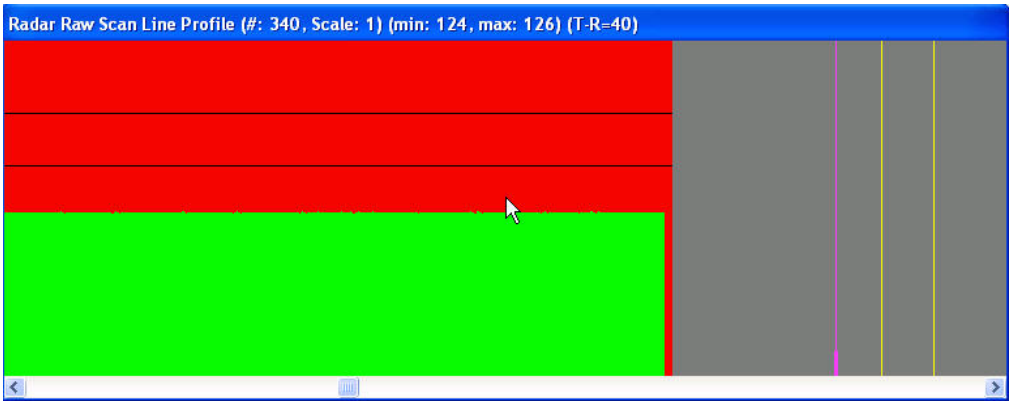


Figure 31 – Radar Raw Scan Line Profile example

To aid the Oscilloscope Mode, the following capabilities are available:

Control of Scale

This capability controls the scale of the Radar Raw Scan Line Profile. Adjust this setting by clicking either the left or right mouse button while the mouse pointer is in the main area of the window.

- **Left Mouse Click = -1**: Left mouse clicks decrement the scale by 1 (down to 1)
- **Right Mouse Click = +1**: Right mouse clicks increment the scale by 1
- **<CTRL> + Left Mouse Button = -25**: holding down the <CTRL> key while clicking the left mouse button decrements the scale by 25 (again, down to 1).
- **<CTRL> + Right Mouse Button = +25**: holding down the <CTRL> key while clicking the right mouse button increments the scale by 25.

Multiple scan lines are displayed in the window, based on scale.

Figure 32 - RadarSample Trigger signal, video divider: 0, scale: 5

Note: scale can also be effectively controlled with the **VIDEO DIV** adjustment slider.

Buffered Data

Data for the Radar Raw Scan Line Profile window is 1024 buffered scan lines at any given time.

Input into this buffer can be paused and/or resumed by clicking on the middle mouse button while the mouse cursor is in the main area of the window. Clicking on the middle mouse button enables you to locate low frequency signals, such as the **SHM Signal**, which usually occurs once every antenna rotation (every 2-3 seconds). Pausing the input and changing the scan line number helps you examine the buffer for a signal.

Representation of LO/HI Values

The two black lines that are graphically drawn on the Radar Raw Scan Line Profile window usually indicate the video threshold and video reference position. However, in Oscilloscope Mode, these lines instead indicate the LO and HI values for the signal being displayed.

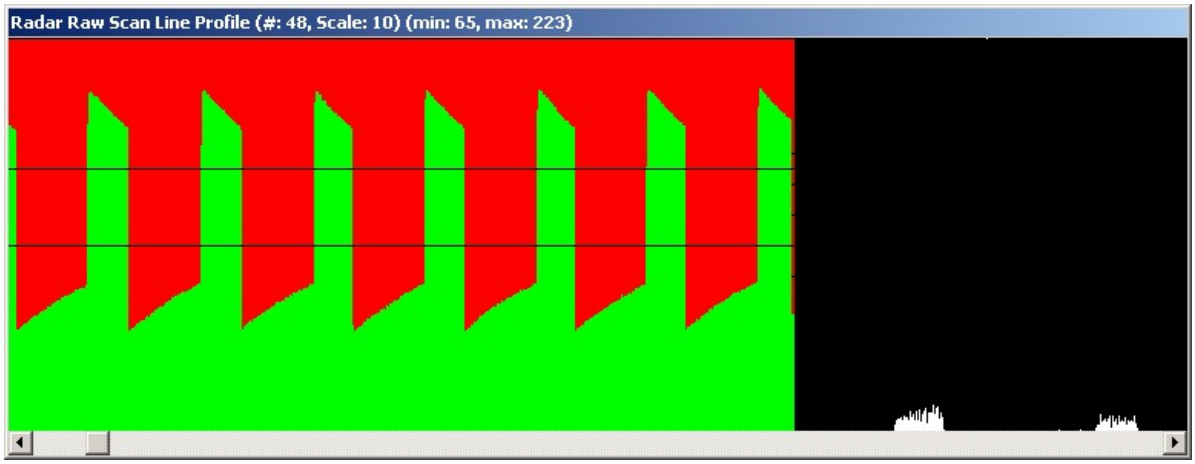


Figure 33 - RadarSample BP signal, video divider: 30, scale: 10

The LO and HI settings should be adjusted so that they define the lowest and highest consistent points of the signal (see **Figures 34-36**).

To properly set up the signal, the gain should be set such that the signal fits inside the signal window.

The “LO” and “HI” settings tell the IR2-BB where the boundaries of each radar signal are located. When the selected signal first crosses the “HI” value, that point is marked as the “HI” point in the signal. The IR2-BB then looks for where the signal crosses the “LO” value, which is subsequently marked as the “LO” point in the signal. This process is repeated constantly throughout operation to maintain accuracy (see **Figures 32-36**).

Figure 34 - RadarSample SHM signal, video divider: 40, scale: 50

With the Oscilloscope Mode enabled, a missing signal selected, and default values set, the signal can be isolated and its values can be captured. The goal of this process is to provide the IR2-BB with the boundaries of the signals.

To properly set up the IR2-BB for each signal, the gain (for the specific signal) should be set such that the signal just fits in the window.

Adjusting the Trigger, Bearing Pulse and Ship's Heading Marker Signals

If the Trigger signal is missing, adjust the HIGH, LOW, and GAIN values on the USB VP Extended Control Window until the signal resumes.

It is possible you will need to change the Edge setting from DN to UP, or vice versa.

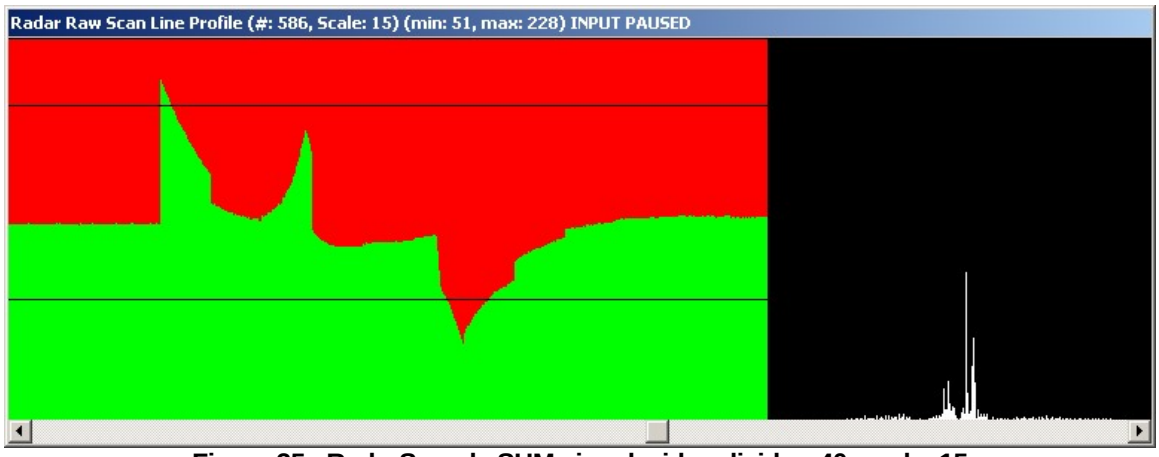


Figure 35 - RadarSample SHM signal, video divider: 40, scale: 15

If the EDGE setting is incorrect, you will see drop in the center of the radar image, or much of the area around the antenna will be missing data, as if the data has been pulled in toward the antenna.

If, after this process, you still have no signal, check the cabling.

Repeat this process for any of the three signals that are missing [Trigger, Ship's Heading Marker (SHM), or Bearing Pulse (BP)], in that order.

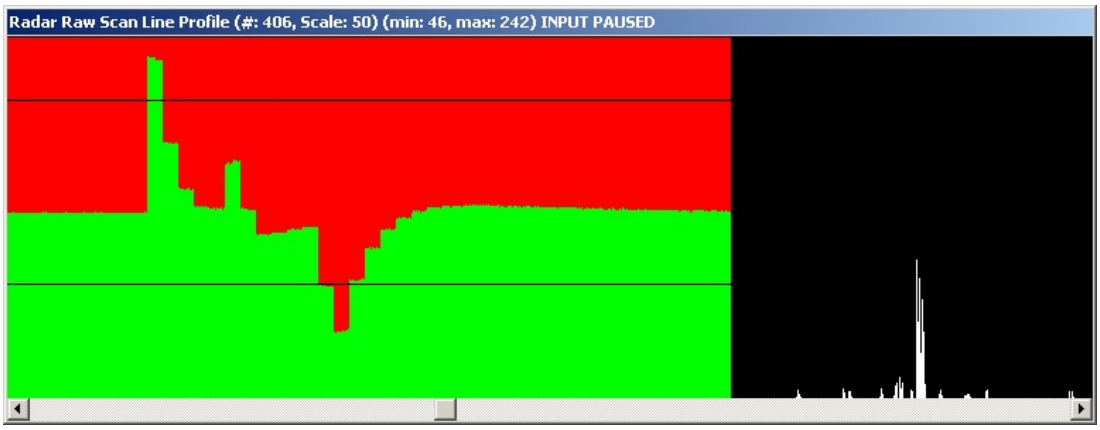


Figure 36 RadarSample SHM signal, video divider: 0, scale: 50

Tip: Click the **SAVE** button on the **USB VP Extended Control Window** regularly as you make progress in acquiring each signal.

After you have performed these adjustments and all three signals are properly acquired, settings can then be adjusted for the Video signal.

Adjusting the Video Signal:

Note: Adjust the Trigger, Bearing Pulse and Ship's Heading Marker signals before adjusting the Video Signal.

To insure that the video signal parameters are correctly set, you will need to define the boundaries of the signal, and determine whether the video signal is positive or negative.

1. Turn the Oscilloscope Mode off.
2. Display the **Radar Scan Line Profile** (see **Figure 36**) and **Radar Raw Scan Line Profile** (see **Figure 30**) windows. This will provide a profile view of a radar scan line. The line number is displayed in the title bar of the two Profile windows.
3. Adjust the scan line displayed using the scroll bars on the bottom of these two profile windows. Two white lines in the main RadarSample radar image window will highlight the scan line being profiled.

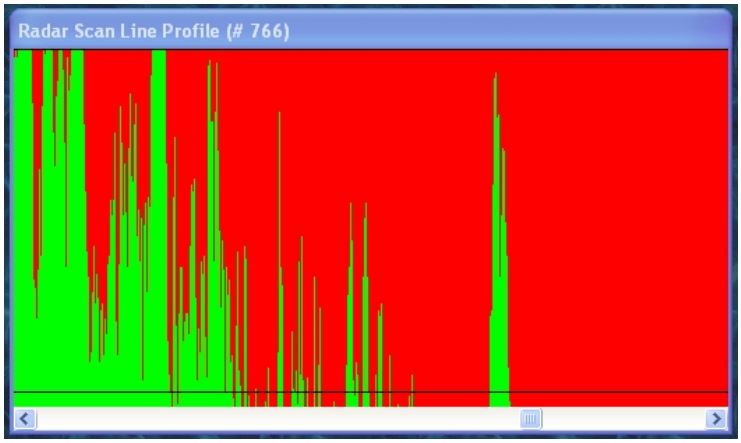


Figure 37 - RadarSample – Scan Line Profile Window – Displayed Data

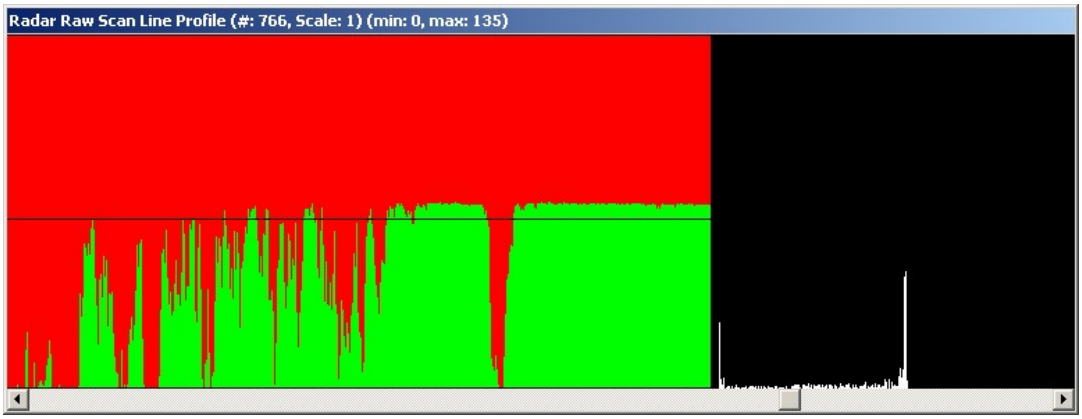


Figure 38 - RadarSample Scan Line Profile Window – Raw Data

4. Click on the **Video POS** radio button on the **USB VP Extended Control** window.
5. The high intensity returns on the radar image should be **red** - if they are **blue**, change the setting from POS to NEG (or vice-versa).
6. Verify that the signal direction is correct using the **Radar Scan Line Profile** window.
7. Set the boundaries of the Video signal. The **Video Threshold** setting determines the lower edge of the video data, and the **Video Reference** setting determines the upper edge. The current setting of these two controls is graphically displayed on the Radar Raw Scan Line Profile window.
8. Once you have adjusted the Video Threshold and Video Reference settings, you should not need to repeat this for any other given model of radar.
9. Before closing or exiting these windows, please insure that all settings have been SAVED.

APPENDIX B: TYPE 2 – ALL OTHER MODELS INSTALLATION INFORMATION

Radar Compatibility

Nobeltec's PC-based radar systems and technology bring a new level of flexibility and capability to the field of radar-assisted navigation. Developed to allow you to seamlessly add the latest radar features to your existing radar equipment, Nobeltec solutions provide you with device interface compatibility unparalleled by any other marine navigation product line.

Please Note: a wide variety of radar systems are available with different capacities, functions, and operating features, and with an equally wide array of mechanical and electrical parameters and installation requirements. *Before proceeding, approved installers must understand the interconnection requirements of the radar model to be connected to the IR2-BB.*

Acronyms

In **Tables 7-14**, a number of acronyms are used to shorten headings:

SO	**Slave Output** connection (option provided by some manufacturers on some models) Many newer radar models have a slave output connector. For slave systems, it is recommended to use this connector rather than directly connect to the antenna cable.
PCB	**Printed Circuit Board** connection (Furuno upgrade option on some models) The Furuno PCB Connector is an option from Furuno for customers who do not want to cut their radar cable to insert a slave connection. The PCB must be retrofitted to the Furuno radar display unit during the IR2-BB slave installation.
TC	**Transceiver Cable** (direct connection)
RTIB	**Radar Transceiver Interface Board**

Radar Wiring Tables

The tables on **Pages 38-42**, organized by radar make and model, list some of the most common radar systems that are IR2-BB-compatible. These tables provide detailed specifications for installing and interfacing to InSight system products. If you do not see your radar model listed, call, fax or email your distributor or Nobeltec, Jeppesen Marine directly (as detailed on the back cover) for more information.

All Supported Radar Transceivers Listed by Make and Model (10/05)

Manufacturer	Models as Slave
FURUNO	M821, M841, M851, M861, M1721, M1731
	FR1510, FR1510DS
	M1800, M1830
	M1831, M1831Mk2, M1931, M1931Mk2, M1941, M1941Mk2
	M1932, 1932Mk2, M1942, M1942Mk2
	FR2110, FR2120
	FR7041, FR7111, FR7112
	FR8100DS, FR8111
	FCR1100
JRC	Radar 2000, 3000
	JMA 2253, 2254
	JMA 3610, 3620, 3625
	JMA 9800
KODEN	MD3604
	MD3640
RAYTHEON	R10XX, R11XX
	R40X, R41X
	R40XX, R41XX
ALL OTHERS [1]	GENERIC CONFIGURATION
	ANRITSU RA713
	ANRITSU RA770UA
	LITTON Bridgemaster

Table 7 - Supported Radar Transceivers by Make & model

[1] Call for detailed specifications

If you do not see your particular make or model in **Table 7**, contact Nobeltec, Jeppesen Marine through one of the methods described on the Back Cover of this Installation Guide.

FURUNO

Furuno with InSight Installed as Slave – Connections by Model#

Furuno Model	InSight Slave Connection		
	SO	TC	PCB (Buffered SO)
M821	Yes	Yes	n/a[1]
M841	Yes	Yes	n/a
M851			
M861			
M1721	n/a	Yes	n/a
M1731	n/a	Yes	n/a
M-1800			
M-1830	n/a	Yes	Yes
M-1831	Yes	Yes	n/a
M-1831MK2	Yes	Yes	n/a
M-1832	Yes	Yes	n/a
M-1900			
M-1930	n/a	please call	Yes
M-1931	Yes	Yes	n/a
M-1931MK2	Yes	Yes	n/a
M-1932	Yes	Yes	n/a
M-1932Mk2	Yes	Yes	n/a
M-1941	Yes	Yes	n/a
M-1941MK2	Yes	Yes	n/a
M-1942	Yes	Yes	n/a
M-1942Mk2	Yes	Yes	n/a
1510[2]	Yes	Yes	
FR1510DS	Yes	Yes	n/a
FR2110	Yes	N/R[3]	n/a
FR2120	Yes	N/R	n/a
EG-3000	n/a	n/a	n/a

[1] not available

[2] Nobeltec does not fully support the Furuno 1500 series.

[3] Not Recommended

FR7041	Yes	Yes	n/a
FR7111	Yes	Yes	n/a
FR7112	Yes	Yes	n/a
FR8100-DS	Yes	Yes	n/a
FR8111	Yes	Yes	n/a
FCR1100	No	Yes	Yes

Table 8 - Furuno Slave Specifications Tables - Index by Model

Other Furuno Connections

InSight – Furuno SO Connector				
INSIGHT		FURUNO SLAVE OUTPUT CONNECTOR		
PIN	SIGNAL	8 PIN Connector (#1)	SIGNAL (#1)	WIRE (#2)
7	Signal Ground	1	GND	
10	Bearing Pulse / Azimuth	4	OP-BP	
11	Bearing Zero / Heading	2	TRU-HD	
12	Video – In (coax core)	8	OP-VIDEO	
13	Video – In GND (coax shield)	7	GND	
15	Trigger Input	6	OP-TRIG	
# 1) Furuno connector no.: Please check the interconnection diagram of your Furuno radar model (slave display interconnection).				
# 2) Furuno cable part no.: Please check the interconnection diagram of your Furuno radar model (slave display interconnection).				

Table 9 - Furuno Slave display Output (SO) connector

InSight – Furuno TC Connection				
INSIGHT		FURUNO TRANSCEIVER CABLE		
PIN	SIGNAL	Furuno Connector DJ1 (#1)	SIGNAL (#1)	WIRE (#2)
7	Signal Ground	(1)	GND	(2)
10	Bearing Pulse / Azimuth		Bearing Pulse (BP)	
11	Bearing Zero / Heading		HEADING (HD)	
12	Video – In (coax core)		VIDEO (coax core)	
13	Video – In GND (coax shield)		GND (coax shield)	
15	Trigger Input		TRIGGER	

# 1)	Furuno connector no.: Please check the interconnection diagram of your Furuno radar model (display unit / antenna unit interconnection).
# 2)	Furuno cable part no.: Please check the interconnection diagram of your Furuno radar model (display unit / antenna unit interconnection).

Table 10 - Furuno Transceiver Cable Connection

InSight – Furuno PCB BUFFER Connector				
INSIGHT		FURUNO BUFFERED SLAVE OUTPUT CONNECTOR		
PIN	SIGNAL	FURUNO Connector (#1)	SIGNAL (#1)	WIRE (#2)
7	Signal Ground	(1)	(1)	(2)
10	Bearing Pulse / Azimuth			
11	Bearing Zero / Heading			
12	Video – In (coax core)			
13	Video – In GND (coax shield)			
15	Trigger Input			
#1)	Furuno slave buffer PCB, part no.: 03P9199, 8-pin connector.			
#2)	Furuno slave buffer PCB cable. Use appropriate cable matching the DJ1 connector of your Furuno radar model.			

Table 11 - Furuno Buffered Slave Output (PCB)

ANRITSU

ANRITSU	InSight		
MODEL Name	Slave		Master
	SO	TC	TC
RA713	n/a	please call	please call
RA770UA	n/a	Table 13	please call

Table 12 - Anritsu Specifications Tables Index by Model

All Other Radars with InSight Installed as Slave

The IR2-BB connects to the transceiver cable. Use these settings for all radar brands listed in this section, which includes the following:

- JRC TC Connection (All Models), JRC RADAR 2000, 3000 and JMA 2253, 2254, 9800 (with Simulator) Systems
- Koden MD3604 and MD3640
- All *non-commercial, non-military* Raytheon
- Anritsu RA770UA
- Litton Bridgemaster (see **Note***)
- All Other Radars (as of 10/05)

A Note About Litton Bridgemaster: Install as SLAVE with Radar Data Buffer Isolator Box (Type LMSC 101-140)

Software settings may need to be changed for proper operation.

InSight - Slave Installation				
INSIGHT		All Other Radars Listed		
PIN	SIGNAL	ANTENNA CONNECTOR (1)	SIGNAL (1)	WIRE (1)
7	Signal Ground	(1)		
10	Bearing Pulse / Azimuth			
11	Bearing Zero / Heading			
12	Video – In (coax core)			
13	Video – In GND (coax shield)			
15	Trigger Input			
(1) See interconnection diagram of your radar model (display unit / antenna unit interconnection cable or slave display option interconnection).				

Table 13 –Cable Connection Wiring for Slave Connection

Raytheon Models Listed for InSight Slave Installation

RAYTHEON Models – InSight Slave Installation						
INSIGHT RTIB MODEL COVERAGE						
Series			R10XX			R11XX
	R40	R40X	R40XX	R41	R41X	R41XX

Table 14 - Raytheon – Models Listed for InSight Slave Installation

LEGAL DISCLAIMER AND LIMITED WARRANTY

Jeppesen Marine® does not warrant that the Nobeltec® **InSight™ Radar 2 – Black Box** is error free nor that it is compatible with products manufactured by any other company than Jeppesen Marine.

The Nobeltec InSight Radar 2 – Black Box works in conjunction with Nobeltec Navigation Software, as well as other digitized chart data and electronic information from the Global Positioning System (GPS), which may contain errors. Jeppesen Marine does not warrant the accuracy of such information, and you are advised that errors in such information may cause the Nobeltec InSight Radar 2 – Black Box to malfunction or give incorrect readings.

Jeppesen Marine is not responsible for damages or injuries caused by your use of or inability to use the Nobeltec InSight Radar 2 – Black Box correctly; by the interaction of the Nobeltec InSight Radar 2 – Black Box with products manufactured by any other agency; or by errors in any chart data or other information utilized by the Nobeltec InSight Radar 2 – Black Box provided by third parties.

Warning: Nautical navigation is an inherently dangerous undertaking and should be engaged in only by persons trained and experienced in navigation. The Nobeltec InSight Radar 2 – Black Box is intended for use only by persons trained in navigation and only as a navigational aid, not as the sole method of navigation.

Please Note: The information in this manual and the specifications included herein are subject to change without notice. Jeppesen Marine shall not be liable for technical or editorial statements, errors or omissions contained herein, nor for incidental or consequential damages resulting from furnishing, performance or use of this material or any version of any Nobeltec software program.

LIMITED WARRANTY

1. **WARRANTY LIMITATION**:

   Jeppesen Marine warrants the Nobeltec **InSight Radar 2 – Black Box** to be free from defects in materials and workmanship for a period of Six (6) Months, except in jurisdictions where such limitation is proscribed by law. This warranty applies to the original purchaser and any subsequent owner during the warranty period, commencing on the date of sale of the unit to the initial purchaser.

   Jeppesen Marine may choose, at its option, to repair or to replace a defective product or any part of the product Jeppesen Marine finds to be defective due to faulty material(s) or workmanship. Jeppesen Marine will perform all such repairs and/or replacements at no charge or at a pro-rated charge, excluding freight costs incurred in shipping to the factory. Return shipments from Jeppesen Marine to points within the United States are made via ground transportation, freight prepaid. *Special shipping charges (overnight, etc.) are the responsibility of the owner*.

   If Jeppesen Marine repairs or replaces a product, the warranty is not extended. Jeppesen Marine owns all replaced parts and products.

To be covered by this warranty, the Nobeltec **InSight Radar 2 – Black Box** must have been in normal use. The warranty does not apply to units with defects caused by improper installation, physical damage, abuse, tampering, lightning or other abnormal electrical discharge, or to units with defaced or altered serial numbers, or to units repaired by unauthorized persons or repaired in a manner that violates Jeppesen Marine's recommended service procedures.

Jeppesen Marine shall not be liable for direct, incidental, special or consequential damages or economic loss, even if caused by the negligence or fault of Jeppesen Marine, except in jurisdictions where such limitation is proscribed by law.

All repairs and replacements made under this warranty must be performed as directed by Jeppesen Marine (see the **GETTING SERVICE** section of this warranty). Performance of unauthorized warranty work elsewhere is not sanctioned, nor will Jeppesen Marine pay for such repairs. Jeppesen Marine will not be responsible for payment of any charges imposed by a Nobeltec dealer or any other party for services requested by and/or performed for a Nobeltec **InSight Radar 2 – Black Box** owner in connection with this warranty. Such services might include removal of the unit from a vessel, inspection, packaging, handling, reinstallation and the like.

Jeppesen Marine assumes no responsibility for any consequential loses of any nature with respect to any of its products or services sold, rendered or delivered. The foregoing is the only warranty expressed or implied. No other warranty exists.

2. **GETTING SERVICE**:

   a) Obtain a **Return Material Authorization Number (RMA)** from Nobeltec Customer Service (see Back Cover for contact information).

      Prior to calling for an RMA, ready the following information:

      - The product **Serial Number**
      - Date and place of purchase (*you will need proof of purchase for service*)
      - Installation and use history

      It is prudent to record the above information at the time of installation and to update your records any time the product is serviced. **Note:** *Jeppesen Marine will not repair any product unaccompanied by an RMA.*

   b) Return the product (along with a copy of your **proof of purchase** and the **RMA** number issued to you by Customer Service) **to the place where it was purchased**. *If your supplier cannot be contacted or cannot supply service for any reason, contact Jeppesen Marine (see Back Cover for contact information).*

3. **RETURNING MATERIAL TO JEPPESEN MARINE**:

   Return your product to Jeppesen Marine ONLY if you cannot receive service from your original dealer as described in Step 2 – GETTING SERVICE on this page.

   From North America only:

      a) Contact Jeppesen Marine to obtain an **RMA number** (see Step 2a above)

b) Pack the unit securely, in the original box if possible

Include on the package label:

- ✓ The **Return Mailing Address** where the repaired unit can be sent
- ✓ The **RMA number**
- ✓ **Jeppesen Marine's address** (*unless instructed to send elsewhere by a Jeppesen Marine Customer Service employee*):

  Nobeltec, Jeppesen Marine – ATT: Service
  15160 NW Laidlaw Road, Suite 100
  Portland, Oregon 97229 USA

c) Include inside the package a **Cover Letter** including:

- ✓ The **RMA number**
- ✓ Your **contact telephone number**
- ✓ A copy of your **dated proof of purchase**
- ✓ A complete description of the problem, including when it happens, what precedes it, and any steps you have already taken to correct it

d) Ship the unit prepaid:

- COD shipments will be refused
- *Shipments without an **RMA number** will be refused*

Note: Return shipments from Jeppesen Marine (within 3-6 weeks) to points within the United States are made via ground transportation, freight prepaid. *Special shipping charges (overnight, etc.) are the responsibility of the owner*.

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